

Sound chapter 15 Quiz next Thursday

Watt is sound? Baby don't Hertz me.

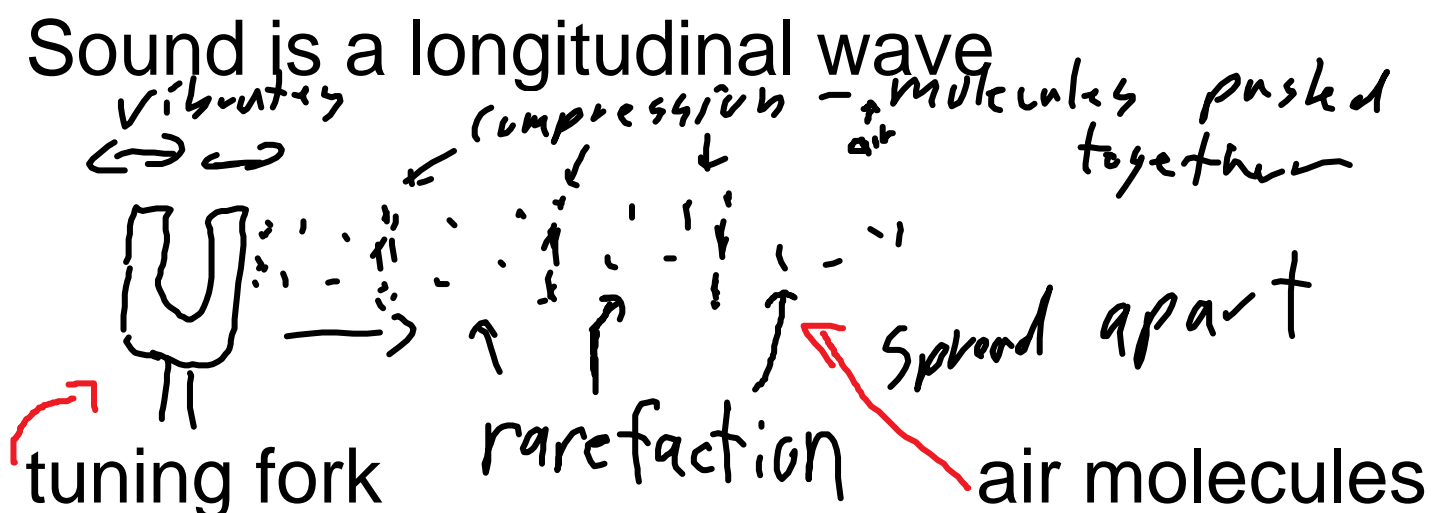
Sound is vibrations you can hear. The pitch of the sound is related to the frequency, higher frequency = higher pitch

<http://onlinetonegenerator.com/hearingtest.html>

sound needs a medium:

<https://www.youtube.com/watch?v=ce7AMJdq0Gw>

Humans can hear between 20-20000Hz but it depends. (I can't hear above 14000Hz but you can)



speed of sound:
distance travelled/time

<https://www.youtube.com/watch?v=BUREX8aFbMs>

The sound wave hit 13 seconds after you see the eruption. If the speed of sound is 344 m/s in air, how far away was the volcano? (no acceleration for waves)

$$v=d/t \quad d=vt = 344 \times 13 = 4,472$$

4.5km away

sound travels at 1500m/s in water

You can also measure the speed of sound by $v=\lambda f$

Different wavelengths resonate in different resonant shapes.

Here his voice resonates in a wine glass creating a standing wave that breaks the glass.

<https://www.youtube.com/watch?>

$v = sH7XSX10QkM$

A wine glass is closed at one end and open at the other, closed tube resonator.

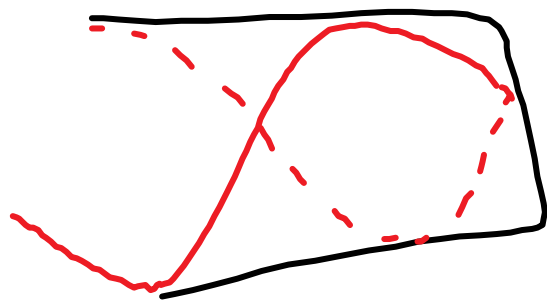


the length of the closed tube is $1/4$ of the wavelength at the lowest resonant frequency - fundamental frequency.

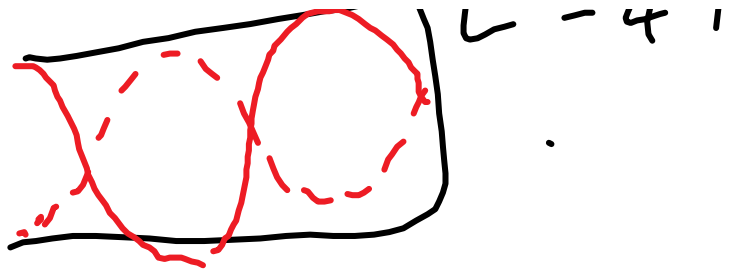
$$L = \lambda/4 = v/4f \quad \text{since } v = \lambda f$$

the next frequency that also resonates in that length

$$L = \frac{3}{4} \lambda$$



$$L = \frac{5}{4} \lambda$$



eg. if 440Hz resonates in a closed tube 19cm long, what is approximately the speed of sound in the room?

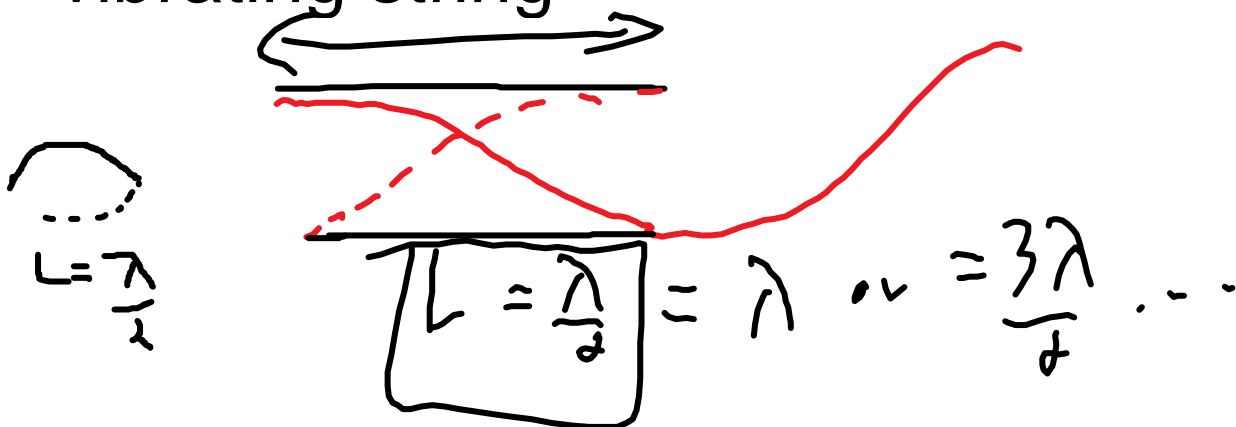
$v = \lambda f$ $L = \lambda/4$ (lowest resonant frequency, fundamental frequency)

$$\lambda = 4L = 4 \times 0.19 = 0.76 \text{ m}$$

$$v = 0.76 \times 440 = 334.4 \text{ m/s}$$

pretty close to the book value of 344m/s

If the tube is open at both ends or it is a vibrating string



fundamental

p309 Q1-4 p318 Q5-8 resonant spacing

is the distance between the two
successive resonant lengths = $\lambda/2$
 $L_2 - L_1 = 3\lambda/4 - \lambda/4 = \lambda/2$

an explanation:

https://www.youtube.com/watch?v=Oc27GxSD_bI

sand making cool standing waves:

<https://www.youtube.com/watch?v=wYoxOJDrZzw>

tacoma narrows bridge collapse

<https://www.youtube.com/watch?v=3mclp9QmCGs>

<https://www.youtube.com/watch?v=nFzu6CNtqec>